AEP's grid SMART Initiative

Southern Governors' Association
2009 Annual Meeting
August 23, 2009

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AEP AMERICAN ELECTRIC POWER

gridSMART℠ from American Electric Power

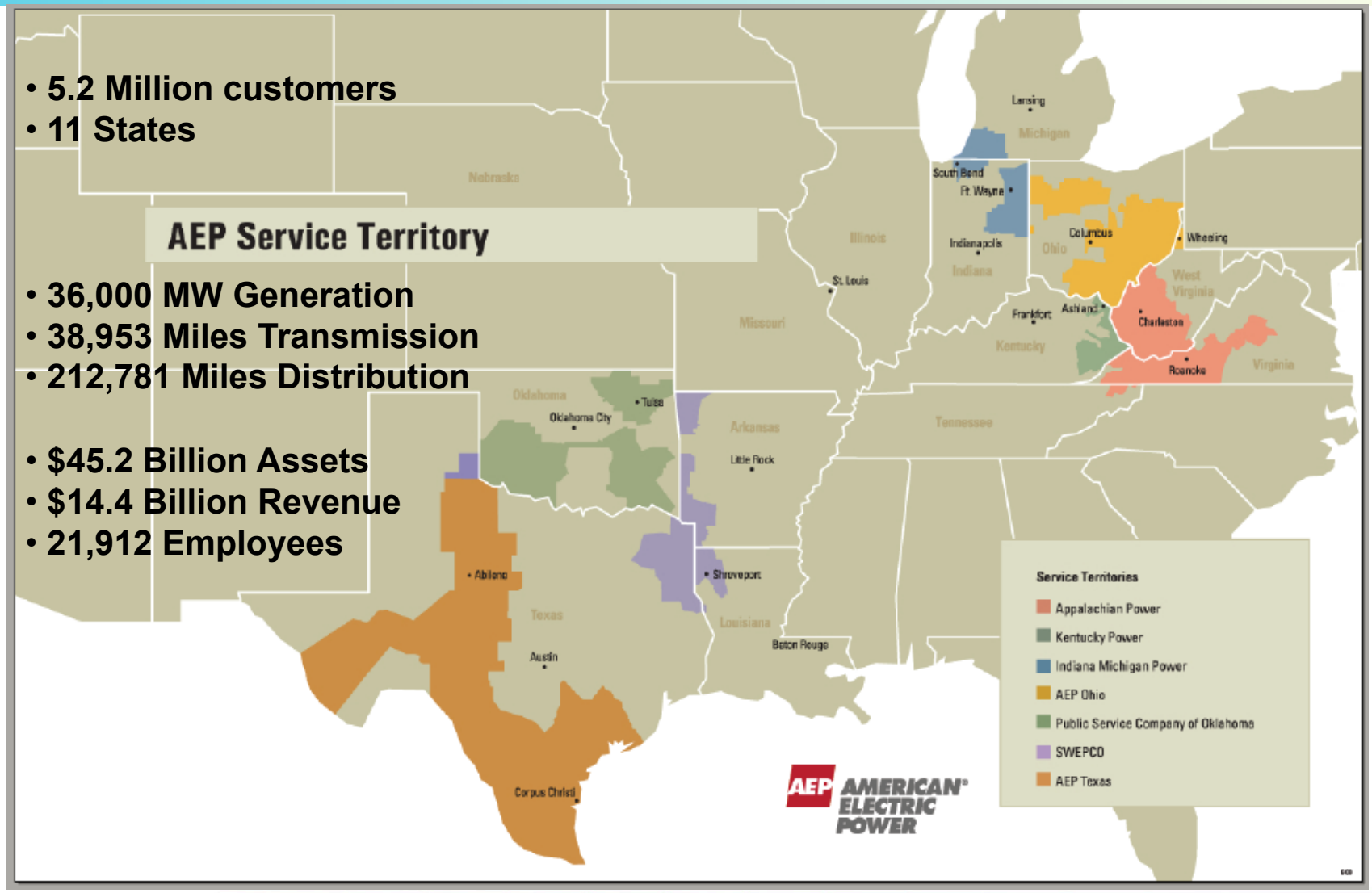
AEP Overview

- 5.2 Million customers
- 11 States

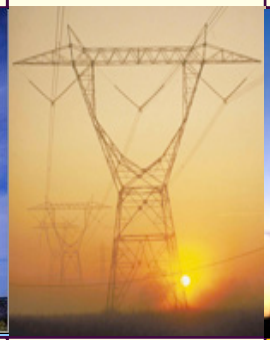
AEP Service Territory

- 36,000 MW Generation
- 38,953 Miles Transmission
- 212,781 Miles Distribution

- $45.2 Billion Assets
- $14.4 Billion Revenue
- 21,912 Employees



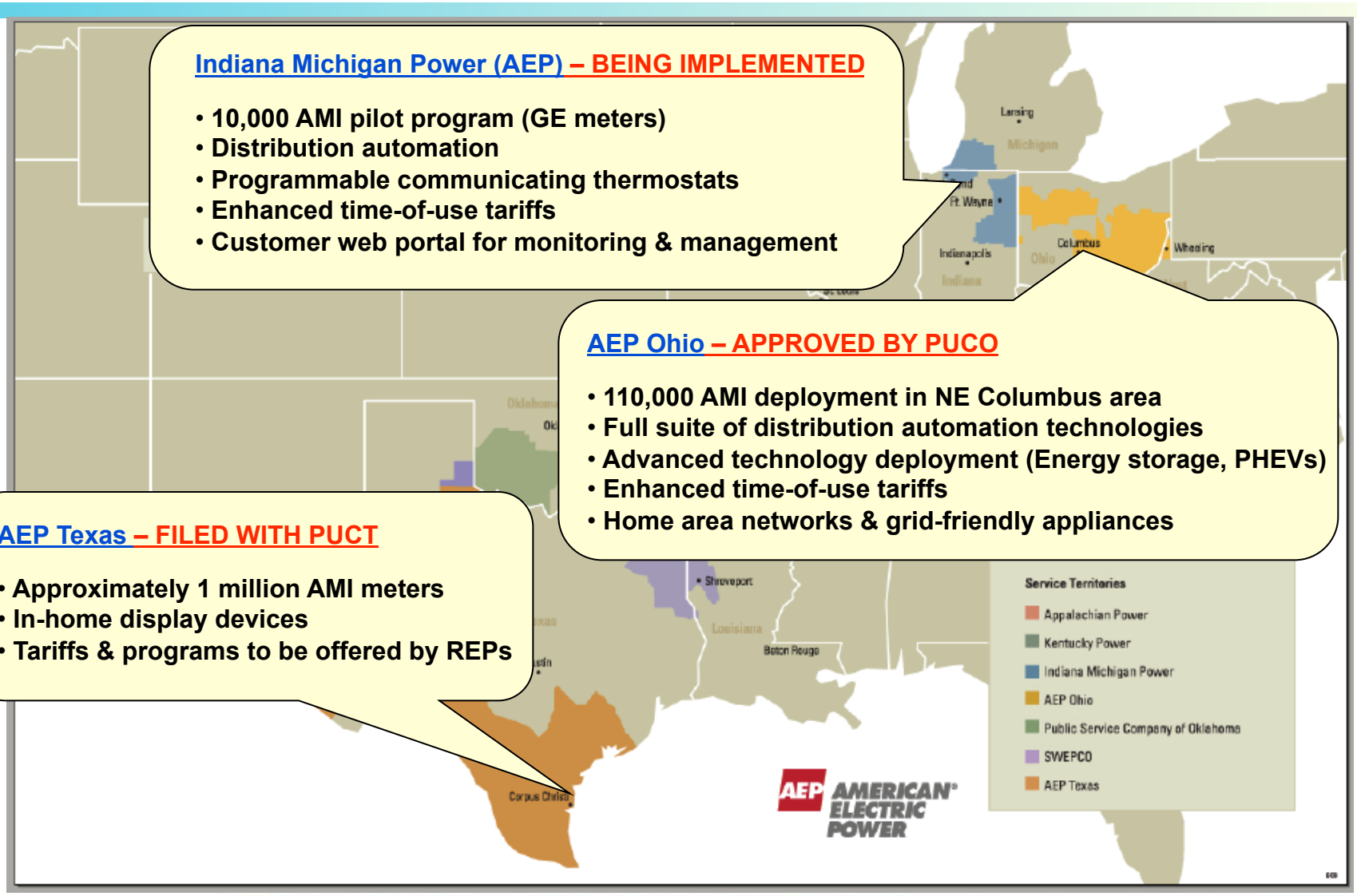
AEP gridSMART Vision

Generation	Transmission	Distribution	Customers
			

• Environmental Projects
• Wind
• IGCC
• Carbon Capture & Storage
	• I-765™
	• Electric Transmission Texas JV
	• Electric Transmission America JV
	• AEP-ABB Alliance
		• Advanced Metering Infrastructure
		• "Smart Meters"
		• Home Area Networks
		• Demand Response architecture
		• Distribution Grid Management
		• Self-healing distribution circuits
		• Internal energy efficiency
		• Platform for advanced visualization & analytics
		• Distributed generation and energy storage
		• AEP-GE Alliance
			• Customer programs and incentives
			  • Energy efficiency
			  • Direct load control
			  • Peak demand reduction
			• Energy storage
			• Energy Information Portal
			• Pre-paid Metering
			• Distributed Generation

Existing generation and transmission control systems	**gridSMART℠**: bridging the gap to provide integrated two-way communications & control across the electricity value chain		Home energy automation

AEP gridSMART Deployment Status



Indiana Michigan Power (AEP) – BEING IMPLEMENTED

- 10,000 AMI pilot program (GE meters)
- Distribution automation
- Programmable communicating thermostats
- Enhanced time-of-use tariffs
- Customer web portal for monitoring & management

AEP Ohio – APPROVED BY PUCO

- 110,000 AMI deployment in NE Columbus area
- Full suite of distribution automation technologies
- Advanced technology deployment (Energy storage, PHEVs)
- Enhanced time-of-use tariffs
- Home area networks & grid-friendly appliances

AEP Texas – FILED WITH PUCT

- Approximately 1 million AMI meters
- In-home display devices
- Tariffs & programs to be offered by REPs

AEP's gridSMART Advanced Technologies

Distributed Renewable Generation

- 70 KW photovoltaic panels installed on roofs of AEP Service Centers in Newark,OH and Athens,OH [70 KW X 2 = 140KW]
- R&D project comparing traditional PV to concentrated PV at AEP's Dolan Engineering lab (Groveport, OH)

PHEVs

- 2 Prius converted to PHEV
- Ford Escape SUV converted to PHEV (EPRI collaborative)
- Field testing to monitor performance

AEP's gridSMART Advanced Technologies

Substation Scale Battery

- **2006:** 1 MW, 7.2 MWh; Deferred substation upgrade in Charleston, WV
- **2008:** Three installations; 2 MW, 14.4 MWh each; With "islanding" in Bluffton,OH; Balls Gap,WV; East Busco,IN
- **2010:** 4MW, 25MWh; To be installed in Presidio, TX

Community Energy Storage

- Small distributed energy storage units connected to the secondary of transformers serving a few houses or commercial loads.
- Pursuing development & deployment:
  - Part of ARRA/Stimulus demonstration grant
  - Proposed to Public Service Commission

Smart Grid: The Benefits

- **Operational Improvements**
  - Reduced costs
  - Reliability improvements
  - Targeted investment
  - Improved safety
- **Energy Market Impacts**
  - Smart grids enable demand response – providing demand elasticity
  - Demand elasticity lowers market clearing price
  - Impacts are large due to steep supply cost curve at times of critical pricing
  - Traditionally, demand is relatively static
- **Environmental Impacts**
  - A smart grid can deliver carbon savings
    - End-use conservation/efficiency; Minimize losses & resistive loads by optimizing distribution voltage; etc.
  - A smart grid can enable more, lower cost carbon savings
    - PHEVs; Support distributed renewable generation; Support intermittent renewables by regulating voltage fluctuations; Efficiently measuring & verifying EE effects; etc.

Smart Grid: The Challenges

- **Regulatory Scrutiny**
  - Tolerance for level of rate increases (fuel increases, environmental compliance, etc.)
  - Difficult economic environment
  - Dependence societal benefits & externalities
- **Codes & Standards**
  - Developing technology area
  - Lack of clarity regarding standards bodies & regulatory organization roles
  - Geographically-distributed nature of investment
- **Current Credit Conundrum**
  - Utility sector extremely capital intensive
  - Recent reductions in credit ratings
  - Current availability & cost of capital

Smart Grid: The Solutions

- **Regulatory Scrutiny**
  - Continue decline in the cost of deployment
  - Collaborative arrangements
  - Phased-deployment approach
  - Demonstration that initiatives can also include ancillary benefits (environmental, capacity needs, etc.)
- **Codes & Standards**
  - Engagement with various constituents to coordinate efforts (NIST, FERC, EPRI, etc.)
  - Avoid proprietary architecture technologies
  - Consider future potential applications
- **Current Credit Conundrum**
  - Need to retain economic health of utilities
  - Need timely return on O&M spent and capital investments
  - Creative alternative cost recovery models